AMENDMENTS TO THE DRAWINGS

Please add new Figure 6 to include a showing of "the method" of the claimed invention. The drawing amendments are described in the application as originally filed and discussed below. No new matter has been added as antecedent support can be found in originally filed Claim 1 and in the originally filed text on pages 1 and 2 (Brief Summary of the Invention), for example.

REMARKS / ARGUMENTS

Applicant's Attorneys thank the Examiner for the courtesy extended during the telephone call between the Examiner and David Arnold, Applicant's Attorney, on August 30, 2006.

During that telephone call, the Examiner agreed to hold an Examiner's interview on the claims listed herein prior to the issuance of an action in a first office action relating to this RCE.

Applicant's Attorneys thank the Examiner for this agreement, and look forward to receiving a phone call from the Examiner in connection with the aforementioned Examiner's interview.

Status of Claims

Claims 1-15 and 17-26 are pending in the application and stand rejected. Claim 16 having been previously canceled. Applicant has amended Claims 1 and 23, and has canceled Claims 24-25, leaving Claims 1-15, 17-23 and 26 for consideration upon entry of the present Amendment.

Applicant respectfully submits that the rejections under 35 U.S.C. §101, 35 U.S.C. §112, second paragraph, 35 U.S.C. §102(b), and 35 U.S.C. §103(a), have been traversed, that no new matter has been entered, and that the application is in condition for allowance.

Drawing Objections

The drawings are objected to for reasons relating to the showing of every feature of the invention specified in the claims. The Examiner maintains that "A figure showing the method is required."

While Applicant respectfully disagrees that a figure showing "the method" is necessary for an understanding of the claimed invention, as such a method is clearly delineated by the text of the specification and claims, Applicant has nonetheless, in an

effort to advance this case to issue, provided herewith new Figure 6, which depicts a flowchart that shows "the method".

No new matter has been added as antecedent support for Figure 6 may be found in the application as originally filed, such as in the language of Claim 1 and in the text on pages 1 and 2 (Brief Summary of the Invention), for example.

Accordingly, Applicant respectfully requests entry of Figure 6, and reconsideration and removal of this objection.

Rejections Under 35 U.S.C. §101

Claims 1-15, 17-26, stand rejected under 35 U.S.C. §101 for reasons relating to the claimed invention allegedly not providing a concrete, useful and tangible result. In the Examiner's Paragraph 8 of the Final Action Paper, "The Examiner respectfully submits, under current PTO practice, that the claimed invention does not recite a *tangible result*. The claims merely recite *an abstract mathematical algorithm*." (Emphasis in the original).

Appellant respectfully traverses this rejection for the following reasons.

In accordance with the Official Gazette Notice of November 22, 2005:

> 'The tangible requirement does not necessarily mean that a claim must either be tied to a particular machine or apparatus or must operate to change articles or materials to a different state or thing. However, the tangible requirement does require that the claim must recite more than a Sec. 101 judicial exception, in that the process claim must set forth ***a practical application*** of that Sec. 101 judicial exception to produce ***a real-world result***. Benson, 409 U.S. at 71-72, 175 USPQ at 676-77 (invention ineligible because had "no substantial practical application."). "***[A]n application of a law of nature or mathematical formula to a . . . process may well be deserving of patent protection.***" Diehr, 450 U.S. at 187, 209 USPQ at 8 (emphasis added); see also Corning, 56 U.S. (15 How.) at 268, 14 L.Ed. 683 ("It is for the discovery or invention of ***some practical method or means of producing a beneficial***

result or effect, that a patent is granted . . ."). In other words, the opposite meaning of "tangible" is "abstract."' (Emphasis added).

Applicant has amended Claim 1 to now recite:

1. A method of estimating the volume of a three-dimensional object having a known contour, the object being an organ or organ part of a body, the method comprising:

acquiring a plurality of two-dimensional images of the organ or organ part that defines the object;

defining a given number of base points on a contour of the object and in a first image of the object, the given number of base points defining facets whose vertices are the base points and which represent a first three dimensional shape of the object;

defining each facet of the first shape by three segments wherein each segment is common to two adjacent facets;

creating second rank points on the contour of the object by dividing the segments so as to constitute a second three-dimensional shape closer to the contour of the object than the first shape, the creation of each second rank point resulting in the creation of at least two new facets and at least three new segments;

defining third or more rank points on the contour of the object by iteratively dividing each new segment into subsegments, so as to represent a third or more three-dimensional shape closer to the contour of the object than the second three-dimensional shape, the creation of the third or more rank points resulting in the creation of at least two additional new facets and at least three additional new segments, the third or more three-dimensional shape forming a final shape from the plurality of facets defined or created, the plurality of facets defining a plurality of triangular surfaces having known vertex points; and

estimating the volume of the final shape using the plurality of triangular surfaces and making available to a user of medical imagery the estimation of the volume of the final shape which is representative of the volume of the three-dimensional organ or organ part.

No new matter has been added as antecedent support may be found in the

application as originally filed, such as at page 1, lines 3-5, page 2, lines 1-11, page 5, lines 18-20, and page 6, lines 8-11, for example.

Here, Applicant clearly identifies that ***a practical application*** of the claimed invention is directed to medical imagery, and that ***a real-world result produced*** is an estimation of the volume of an organ or organ part of a body from medical images thereof, which one skilled in the art would recognize would be valuable for determining the size (volume) of an abnormal growth showing on an X-ray film, for example.

Additionally, it is not merely the calculation of a tessellated volume that is being claimed, but the method of defining base points ***on a contour*** of an image of an object, creating therefrom connected triangular facets, segmenting the triangular facets by defining additional points ***on the contour*** of the object, ***creating a representation*** of the organ or organ part under study (forming a final shape), and then estimating the volume of the organ or organ part by calculating the volume of the final shape. It is the estimated volume of the organ or organ part that is of interest, not merely the volume of the final shape.

Accordingly, Applicant respectfully submits that the claimed invention does recite ***a tangible result*** in that it recites ***a practical application*** to produce ***a real-world result***, and therefore respectfully requests reconsideration and withdrawal of this rejection, which Applicant considers to be traversed.

Claim Objections

Claims 24 and 25 are objected to for various informalities.

Applicant has canceled Claims 24 and 25, thereby obviating this objection.

Double Patenting

The Examiner comments that should Claim 23 be found allowable, Claim 25 will be objected to as being a substantial duplicate thereof.

Applicant has canceled Claim 25, thereby obviating this objection.

Rejections Under 35 U.S.C. §112, Second Paragraph

In the Advisory Action dated August 23, 2006 (Paper No. 20060817, page 2), the Examiner acknowledges that "Applicant's arguments relating to density are persuasive and would be withdrawn if such amendment was separately submitted."

For completeness, however, Applicant herein provides a complete response to the aforementioned Final Action.

I. Claims 1-15, 17-26 stands rejected under 35 U.S.C. §112, second paragraph, as being allegedly incomplete for omitting steps between the tessellating and calculating, such omission amounting to a gap between the steps.

II. Claims 23 and 25 stand rejected under 35 U.S.C. 112, second paragraph, as being allegedly incomplete for omitting the steps of calculating density.

III. Claim 24 stands rejected under 35 U.S.C. 112, second paragraph, as being allegedly incomplete for omitting steps referred to but not listed.

IV. Claims 21, 25 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant traverses these rejections for the following reasons.

Regarding I.

Applicant respectfully submits that where the specification provides general guidelines as to the scope of the invention such that one of ordinary skill in the art would know what was meant, the subject matter of the invention would have been described and supported in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Applicant believes the present specification and claims satisfy that burden.

Applicant has amended Claim 1 to now recite:

1. A method of estimating the volume of a three-dimensional object having a known contour, the object being an organ or organ part of a body, the method comprising:

acquiring a plurality of two-dimensional images of the organ or organ part that defines the object;

defining a given number of base points on a contour of the object and in a first image of the object, the given number of base points defining facets whose vertices are the base points and which represent a first three dimensional shape of the object;

defining each facet of the first shape by three segments wherein each segment is common to two adjacent facets;

creating second rank points on the contour of the object by dividing the segments so as to constitute a second three-dimensional shape closer to the contour of the object than the first shape, the creation of each second rank point resulting in the creation of at least two new facets and at least three new segments;

defining third or more rank points on the contour of the object by iteratively dividing each new segment into subsegments, so as to represent a third or more three-dimensional shape closer to the contour of the object than the second three-dimensional shape, the creation of the third or more rank points resulting in the creation of at least two additional new facets and at least three additional new segments, the third or more three-dimensional shape forming a final shape from the plurality of facets defined or created, the plurality of facets defining a plurality of triangular surfaces having known vertex points; and

estimating the volume of the final shape using the plurality of triangular surfaces and making available to a user of medical imagery the estimation of the volume of the final shape which is representative of the volume of the three-dimensional organ or organ part.

No new matter has been added as antecedent support may be found in the application as originally filed, such as at page 1, lines 3-5, page 2, lines 1-11, page 4, lines 7-9, page 5, lines 18-20, and page 6, lines 8-11, for example. Dependent claims inherit all of the limitations of the parent claim.

Here, Applicant clarifies that the estimating of the volume involves estimating the volume of the final shape (representative of the organ or organ part) using the plurality of triangular surfaces, the coordinates of whose vertex points being known. The actual equation or computer algorithm that may be used in the calculation is well within the

purview of one skilled in the art, especially one skilled in the technical art of mathematics and computer science, is not intended to be a limiting element of the claimed invention, and is not necessary to include since it is already well known to one skilled in the art.

For example, the tessellated surface formed from the triangular facets may be viewed as approximating a sphere, since the claimed invention is directed at ***estimating*** the volume, not calculating the volume with utmost precision. As such, one skilled in the art will appreciate that the known vertices will enable the surface area of each triangle to be calculated, which in turn will enable the total surface area to be calculated, which in turn will enable the volume to be calculated, since the total surface area of a sphere defines the radius of the sphere (Area = 4*pi*radius^2), and the radius defines the volume (Volume=(4/3)*pi*radius^3), at least for purposes of ***estimating the volume***, which is commensurate with the scope of the claims.

As a further example, an exemplary algorithm for determining in a more general sense the volume of a closed tessellated object in a CAD file using triangular facets may be found on the internet at http://www.math.niu.edu/~rusin/known-math/95/volume.poly, which presents in a 1995 publication from a newsgroup participant the type of algorithm that was well known to one skilled in the art at the time the instant invention was made.

As yet a further example, the volume of a tetrahedron may be determined using the well known Piero Della Francesca's formula, which may be found on the internet at http://www.mathpages.com/home/kmath424.htm, and which Applicant submits dates back to the 15th century. By using edge-connected triangular surfaces, a plurality of tetrahedrons can be visualized, which can then be used to calculate a total volume of the final shape by summing the individual volumes of each tetrahedron.

In the claimed invention, Applicant is not claiming any of the aforementioned well-known equations or algorithms, but instead is claiming an iterative approach to create second and third rank points that progressively subdivide the segments of the base facets to more closely match the contour of the organ or organ part being studied. Nowhere in the prior art does Applicant find such a disclosure or teaching.

In view of the foregoing, Applicant respectfully submits that the claimed subject

matter is described in such a manner that reasonably conveys to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Accordingly, Applicant respectfully requests the Examiner to reconsider and withdraw this rejection, which Applicant considers to be traversed.

Regarding II.

Applicant submits that where the claims define patentable subject matter with a reasonable degree of particularity and distinctness, the claims should be allowed. Some latitude in the manner of expression and the aptness of terms should be permitted even though the claim language is not as precise as may be desired. Claims should not be rejected if the expression selected by Applicant satisfies the statutory requirements. In viewing a claim for compliance with 35 U.S.C. §112, second paragraph, the claim as a whole must be considered to determine whether the claim apprises one of ordinary skill in the art of its scope and, therefore, serves the required notice function. MPEP 2173.02. (Emphasis in the original).

Applicant has canceled Claim 25, and has amended Claim 23 to now recite, inter alia:

"...wherein subsequent to the calculation of the estimated volume of the object, the distribution of the density of the object in space is calculated."

No new matter has been added as antecedent support may be found in the application as originally filed, such as at page 3, lines 6-7, for example.

The Examiner remarks that the steps for calculating density are missing.

In respectful disagreement with the Examiner, Applicant submits that it is not the density of the object that is being calculated, but the distribution of the density, which one skilled in the art would appreciate may be accomplished by applying a distribution function to the intensity of the features defining the object in the images being studied.

In view of the foregoing, Applicant respectfully submits that the claimed subject matter is described in such a manner that reasonably conveys to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention, defined the claimed subject matter with a reasonable degree of particularity

and distinctness, and therefore respectfully requests reconsideration and withdrawal of all rejections under 35 U.S.C. §112, second paragraph, which Applicant considers to be traversed.

Regarding III.

Applicant has canceled Claim 24, thereby obviating this rejection.

Regarding IV.

At the outset, Applicant notes that the Examiner refers to Claims 21 and 25 as including the term "density", where the record shows that it is Claims 23 and 25 that include the term "density". Accordingly, Applicant responds with reference to Claims 23 and 25.

For at least the reasons set forth above Regarding II, Applicant respectfully submits that the rejection to Claim 23 has been obviated (Applicant has canceled Claim 23), and that the rejection to Claim 25 has be overcome (Applicant presents reasoning set forth above as to how the claimed invention is directed to the distribution of the density of the object, how one skilled in the art would appreciate what the scope of Applicant's invention was, and therefore submits that the term "density" would not be ambiguous to one skilled in the art).

Furthermore, the Examiner rejects Claims 25 by remarking that the term "density" is ambiguous, but does not provide any clarification as to what the ambiguity is or what is causing the ambiguity. In the event that the Examiner maintains this rejection, Applicant respectfully requests that the finality of the office action be removed, and that the Examiner provide further clarification as to what the ambiguity is, thereby providing Applicant with an appropriate opportunity to more specifically respond to this rejection.

Rejections Under 35 U.S.C. §102(b)

Claims 1-3, 7-14, 17-23, 25-26 stand rejected under 35 U.S.C. §102(b) as being anticipated by Finnigan et al. (U.S. Patent No. 5,345,490, hereinafter Finnigan).

Applicant traverses this rejection for the following reasons.

Applicant respectfully submits that "[a] claim is anticipated only if each and every

element as set forth in the claim is found, either expressly or inherently described, ***in a single prior art reference***." *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). Moreover, "[t]he identical invention must be shown in as complete detail as is contained in the *** claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Furthermore, the single source must disclose all of the claimed elements "arranged as in the claim." Structural Rubber Prods. Co. v. Park Rubber Co., 749 F.2d 707, 716, 223 U.S.P.Q. 1264, 1271 (Fed. Cir. 1984). Missing elements may not be supplied by the knowledge of one skilled in the art or the disclosure of another reference. Titanium Metals Corp. v. Banner, 778 F.2d 775, 780, 227 U.S.P.Q. 773, 777 (Fed. Cir. 1985).

Applicant has amended Claim 1 as set forth above.

No new matter has been added as set forth above.

Dependent claims inherit all of the limitations of the parent claim.

In respectful disagreement with the Examiner, Applicant finds Finnigan to disclose a method and apparatus for converting CT data into finite element models (Abstract), and to be absent the disclosure of each and every element of the claimed invention arranged as claimed.

More specifically, Applicant's claimed invention as amended is directed to: "defining a given number of base points ***on a contour*** of the object..."; "creating second rank points ***on the contour*** of the object..."; and "defining third or more rank points ***on the contour*** of the object...". From these points ***on the contour*** of the object, a plurality of triangular facets are created to form a final shape ***formed only from two-dimensional surfaces*** that is representative of the three-dimensional organ or organ part under study.

In comparison, Applicant submits that Finnigan discloses a method of converting CT data into a finite element model using automatic mesh generation (Abstract). Here, Applicant finds Finnigan to disclose the generation of a 2D finite element model from a CT slice using QUADTREE, and the generation of a 3D finite element model from a plurality of CT slices using OCTREE (col. 3, lines 14-20).

In comparing Finnigan with the claimed invention, Applicant submits that a 2D finite element model made from 2D elements and representing a 2D object is substantially different from a plurality of 2D surfaces representing a 3D volume, and that a 3D finite element model made for 3D elements and representing a 3D object is substantially different from a plurality of 2D surfaces representing a 3D volume, where the 2D surfaces have vertex points on the contour of the object and no points in the interior of the 3D volume, unlike 3D elements internal to the object.

Accordingly, Applicant finds Finnigan is absent any disclosure of:

"...defining a given number of ***base points on a contour of the object*** and in a first image of the object, ***the given number of base points defining facets whose vertices are the base points and which represent a first three dimensional shape of the object***;

defining each facet of the first shape by three segments wherein each segment is common to two adjacent facets;

creating second rank points on the contour of the object by dividing the segments so as to constitute a second three-dimensional shape closer to the contour of the object than the first shape, the creation of each second rank point resulting in the creation of at least two new facets and at least three new segments;

defining third or more rank points on the contour of the object by iteratively dividing each new segment into subsegments, so as to represent a third or more three-dimensional shape closer to the contour of the object than the second three-dimensional shape, the creation of the third or more rank points resulting in the creation of at least two additional new facets and at least three additional new segments, the third or more three-dimensional shape ***forming a final shape from the plurality of facets defined or created***, the plurality of facets defining a plurality of triangular surfaces having known vertex points; and

estimating the volume of the final shape using the plurality of triangular surfaces and making available to a user of medical imagery the estimation of the volume of the final shape which is representative of the volume of the three-dimensional organ or organ part."

In comparing Finnigan with the claimed invention, Applicant finds Finnigan to be deficient any disclosure of modifying the facets of a tessellated surface to more closely match the contour of the object being studied, and to be absent any disclosure of using a plurality of resulting triangular surfaces that closely match a contour of the object to estimate the volume of the object.

Accordingly, Applicant submits that Finnigan does not disclose all of the claimed elements arranged as in the claim, and absent anticipatory disclosure in Finnigan of each and every element of the claimed invention arranged as in the claim, Finnigan cannot be anticipatory.

In view of the amendment and foregoing remarks, Applicant submits that Finnigan does not disclose each and every element of the claimed invention arranged as claimed and therefore cannot be anticipatory. Accordingly, Applicant respectfully submits that the Examiner's rejection under 35 U.S.C. §102(b) has been traversed, and requests that the Examiner reconsider and withdraw of this rejection.

Rejections Under 35 U.S.C. §103(a)

Claims 4-6 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Finnigan in view of Kamen et al. (U.S. Patent No. 5,905,500, hereinafter Kamen).

Claim 15 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Finnigan in view of Akiyama (U.S. Patent No. 5,798,764, hereinafter Akiyama).

Applicant traverses these rejections for the following reasons.

Applicant respectfully submits that the obviousness rejection based on the References is improper as the References fail to teach or suggest each and every element of the instant invention in such a manner as to perform as the claimed invention performs. For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a prima facie case of obviousness. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). The Examiner must meet the burden of establishing that all elements of the invention are taught or suggested in the prior art. MPEP §2143.03.

Additionally, Applicant submits that dependent claims inherit all of the limitations

of the parent claim and any intervening claims, and that a claim dependent upon an allowable claim is also allowable.

The Examiner applies Kamen for reasons relating to Kamen's teaching of subdivision by two. Paper 20060528, page 9.

The Examiner applies Akiyama for reasons relating to Akiyama's teaching of the number of base points being six. Paper 20060528, page 9.

First, Applicant submits that Claims 4-6 and 15 are dependent claims, and for at least the reasons set forth above regarding the allowability of the parent claim, Claims 4-6 and 15 are allowable for the sole reason that they depend from an allowable claim.

Additionally, Applicant submits that Kamen and Akiyama fall wholly short of curing the deficiencies of Finnigan with respect to the limitations noted above regarding the rejections under 35 U.S.C. §102.

In view of the foregoing, Applicant submits that the References fail to teach or suggest each and every element of the claimed invention and are therefore wholly inadequate in their teaching of the claimed invention as a whole, fail to motivate one skilled in the art to do what the patent Applicant has done, fail to offer any reasonable expectation of success in combining the References ***to perform as the claimed invention performs***, and discloses a substantially different invention from the claimed invention, and therefore cannot properly be used to establish a prima facie case of obviousness. Accordingly, Applicant respectfully requests reconsideration and withdrawal of all rejections under 35 U.S.C. §103(a), which Applicant considers to be traversed.

In light of the forgoing, Applicant respectfully submits that the Examiner's rejections under 35 U.S.C. §101, 35 U.S.C. §112, second paragraph, 35 U.S.C. §102(b), and 35 U.S.C. §103(a), have been traversed, and respectfully requests that the Examiner reconsider and withdraw these rejections.

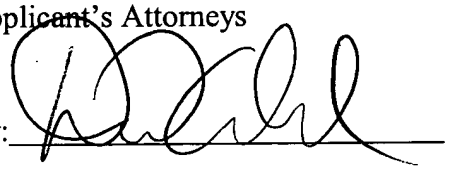
The Commissioner is hereby authorized to charge any additional fees that may be required for this amendment, or credit any overpayment, to Deposit Account No. 50-2513.

In the event that an extension of time is required, or may be required in addition to that requested in a petition for extension of time, the Commissioner is requested to grant a petition for that extension of time that is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to the above-identified Deposit Account.

Respectfully submitted,

CANTOR COLBURN LLP

Applicant's Attorneys

By: 

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